



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/849,537	05/07/2001	Tonglong Zhang	1875.0370000	7984
7590 07/14/2005			EXAMINER	
STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C.			LEWIS, MONICA	
Suite 600			ART UNIT	
1100 New York Avenue, N. W.			PAPER NUMBER	
Washington, DC 20005-3934			2822	

DATE MAILED: 07/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

SM

**Office Action Summary****Application No.**

09/849,537

**Applicant(s)**

ZHANG ET AL.

**Examiner**

Monica Lewis

**Art Unit**

2822

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 April 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 3,4,6,7,9,10,12,13,16,17,38-65 and 68-70 is/are pending in the application.
- 4a) Of the above claim(s) 3,4,6,7,9,10,12,38-51,60-65 and 68 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13,16,17,52-59 and 69 is/are rejected.
- 7) ☒ Claim(s) 70 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 October 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4/05</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. This office action is in response to the request for continued examination filed April 19, 2005.

#### ***Response to Arguments***

2. Applicant's arguments with respect to claims 13, 16, 17, 52-59, 69 and 70 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Continued Examination Under 37 CFR 1.114***

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/19/05 has been entered.

#### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2822

5. Claims 13, 16, 17 and 52-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Culnane et al. (U.S. Patent No. 5,744,863) in view of Utagikar et al. (U.S. Patent No. 6,583,513).

In regards to claim 13, Culnane et al. ("Culnane") discloses the following:

a) a substrate (256) having a plurality of contact pads (254) on a first surface electrically connected through said substrate to a plurality of solder balls (259) on a second surface of said substrate (For Example: See Figure 5);

b) an integrated circuit die (252) that is mounted to said first surface of said substrate (For Example: See Figure 5);

c) a ring shaped stiffener (262) being centrally open in a first surface and a second surface wherein said first surface of said ring shaped stiffener is attached to said first surface of said substrate (For Example: See Figure 5); and

d) die is mounted to said first surface of said substrate in a flip chip configuration, wherein a conductive bump (258) on an active surface of said IC die is connected to said first surface of said substrate (For Example: See Figure 5).

In regards to claim 13, Culnane fails to disclose the following:

a) a heat spreader that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate and wherein the second surface of said heat spreader is capable of being coupled to a printed circuit board.

However, Utagikar et al. ("Utagikar") discloses a semiconductor device with a heat spreader (146) that has a first surface and a second surface, wherein said first surface of said heat spreader is attached to said second surface of said substrate and wherein the second surface of said heat spreader is capable of being coupled to a printed circuit board (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include a heat spreader as disclosed in Utagikar because it aids in conducting heat (For Example: See Column 6 Lines 18 and 20).

Additionally, since Culnane and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Culnane.

In regards to claim 16, Culnane discloses the following:

a) a second heat spreader (270) attached to a non-active surface of said IC die and a said second surface of said ring shaped stiffener (For Example: See Figure 5).

In regards to claim 17, Culnane fails to disclose the following:

a) a via located proximate to said mounted IC die that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device with a via (170) located proximate to said mounted IC die (110) that extends through said substrate, wherein said via is filled with a conductive material to couple said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

Additionally, since Culnane and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Culnane.

In regards to claim 52, Culnane discloses the following:

a) second heat spreader is attached to said second surface of said ring shaped stiffener with a thermally conductive adhesive (272) material (For Example: See Figure 5).

Art Unit: 2822

In regards to claim 53, Culnane discloses the following:

a) second heat spreader is attached to said nonactive surface of said IC die with a thermally conductive adhesive material (274) (For Example: See Figure 5).

In regards to claim 54, Culnane discloses the following:

a) heat spreader comprises at least one metal (For Example: See Column 5 Lines 20-22).

In regards to claim 55, Culnane discloses the following:

a) at least one metal includes copper (For Example: See Column 5 Lines 20-22).

In regards to claim 56, Culnane discloses the following:

a) at least one metal includes aluminum (For Example: See Column 5 Lines 20-22).

In regards to claim 57, Culnane discloses the following:

a) second heat spreader is substantially planar (For Example: See Figure 5).

In regards to claim 58, Culnane fails to disclose the following:

a) conductive material filling said via thermally couples said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device where the conductive material filling said via thermally couples said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

Art Unit: 2822

Additionally, since Culnane and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Culnane.

In regards to claim 59, Utagikar fails to disclose the following:

a) conductive material filling said via electrically couples said conductive bump to said heat spreader.

However, Utagikar discloses a semiconductor device where the conductive material filling said via electrically couples said conductive bump to said heat spreader (For Example: See Figure 4). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include a via as disclosed in Utagikar because it aids in efficiently dispersing heat (For Example: See Column 2 Lines 65-67).

Additionally, since Culnane and Utagikar are both from the same field of endeavor (semiconductors), the purpose disclosed by Utagikar would have been recognized in the pertinent art of Culnane.

6. Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over Culnane et al. (U.S. Patent No. 5,744,863) in view of Utagikar et al. (U.S. Patent No. 6,583,513) and Chen et al. (U.S. Patent No. 5,903,052).

In regards to claim 69, Culnane fails to disclose the following:

a) an outer profile of the heat spreader overlaps with an inner profile of the ring shaped stiffener.

However, Chen discloses that an outer profile of the heat spreader (16) overlaps with an inner profile of the ring shaped stiffener (12a) (For Example: See Figure 1). It would have been

Art Unit: 2822

obvious to one having ordinary skill in the art at the time the invention was made to modify the semiconductor device of Culnane to include an outer profile of the heat spreader that overlaps with an inner profile of the ring shaped stiffener as disclosed in Chen because it aids in providing the device with good efficiency (For Example: See Column 2 Lines 8 and 9).

Additionally, since Culnane and Chen are both from the same field of endeavor (semiconductors), the purpose disclosed by Chen would have been recognized in the pertinent art of Culnane.

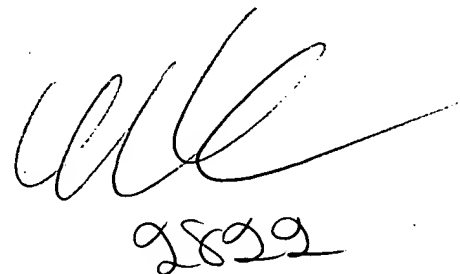
***Allowable Subject Matter***

7. Claim 70 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica Lewis whose telephone number is 571-272-1838. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 571-272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7722 for regular and after final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ML  
July 11, 2005

A handwritten signature in black ink, followed by the number 2822 written below it.